

REMARKS

Rejections under 35 USC §102(b)

Claims 1-3, 5 and 6 are rejected under 35 USC §102(b) as being anticipated by Rairden, III (U.S. Patent No. 3,998,603).

Claim 1 has been amended to recite **“an inner Cr layer with Cr content of about 85 atomic percent to about 95 atomic percent** in the form of α -Cr phase composed of precipitates between the substrate and an outer layer and the outer layer composed of a β phase (Ni-Al-Cr) and a γ' phase (Ni₃Al(Cr)), wherein the Al content in the outer layer is homogeneous and is at least 20 atomic percent, and the Cr content in the outer layer is saturated, wherein said multi-layer surface structure is formed by **diffusing Al in a NiAl₃ (+Ni₂Al₃) layer** formed on the Ni-alloy substrate containing Cr, or on a Cr-containing layer coated on the Ni alloy substrate.”

The recitation “an inner Cr layer with Cr content of about 85 atomic percent to about 95 atomic percent” is supported in the original disclosure in FIGS. 3 and 5. In FIG. 3, in the range indicated as “inner layer,” Cr contents concentrates within the range from about 85 atomic percent to about 95 atomic percent.” In FIG. 5, in the depth range indicated as “inner layer” Cr content falls within about 85 atomic percent to about 95 atomic percent.” Although the values “about 85 atomic percent” and “about 95 atomic percent” do not explicitly appear in the specification, these values can be read from the data in FIGS. 3 and 5 by a person of ordinary skill in the art.

This kind of support has been recognized in the USPTO practice. Regarding the support of numerical ranges the MPEP explains as follows:

III. RANGE LIMITATIONS

With respect to changing numerical range limitations, **the analysis must take into account which ranges one skilled in the art would consider inherently supported by the discussion in the original disclosure.** In the decision in *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), the ranges described in the original specification included a range of "25%- 60%" and **specific examples of "36%" and "50%."** A corresponding new claim limitation to "at least 35%" did not meet the description requirement because the phrase "at least" had no upper limit and caused the claim to read literally on embodiments outside the "25% to 60%" range, however **a limitation to "between 35% and 60%" did meet the description requirement.**

MPEP 2163.05 III, emphasis added. One skilled in the art would consider that the amended features are inherently supported by the original disclosure.

The recitation **"diffusing Al in a NiAl₃ (+Ni₂Al₃) layer** formed on the Ni-alloy substrate containing Cr, or on a Cr-containing layer coated on the Ni alloy substrate" is supported in the original disclosure, from page 7, line 18 to page 8, line 17, and at page 9, lines 9-11.

Also, the recitation **"the Cr content in the outer layer is saturated"** is supported in the original disclosure at page 9, lines 15-17.

The difference in the structure between the present invention and Raiden, III results from the method of making of the present invention. The Explanatory Drawing attached hereto illustrates the differences. According to the present invention, (1) Al and Ni-Cr alloy are heated at a relatively low temperature, which causes interdiffusion of Al and Ni to form NiAl₃ (+Ni₂Al₃)

layer. Then, (2) NiAl_3 (+ Ni_2Al_3) layer is heated at a relatively high temperature, which causes interdiffusion of Ni and Cr to changing NiAl_3 (+ Ni_2Al_3) layer to β phase (Ni-Al-Cr) layer.

Because Cr cannot dissolve more than about 10 at %, which is solubility limit of Cr in β phase (Ni-Al-Cr) layer, Cr excess of the solubility limit precipitates under the β phase (Ni-Al-Cr) layer, forming inner Cr layer, which contains extremely high Cr.

According to Rairden, III, because Al is not diffused at a relatively low temperature but immediately diffused at a high temperature in the range of 1040-1230°C, β phase (Ni-Al-Cr) layer is not formed. This is the reason why Cr concentration of the high Cr layer is not so high as that of the present invention.

Thus, Rairden, III does not teach or suggest **“an inner Cr layer with Cr content of about 85 atomic percent to about 95 atomic percent** in the form of α -Cr phase composed of precipitates between the substrate and an outer layer and the outer layer composed of a β phase (Ni-Al-Cr) and a γ' phase ($\text{Ni}_3\text{Al}(\text{Cr})$), wherein the Al content in the outer layer is homogeneous and is at least 20 atomic percent, and the Cr content in the outer layer is saturated, wherein said multi-layer surface structure is formed by **diffusing Al in a NiAl_3 (+ Ni_2Al_3) layer** formed on the Ni-alloy substrate containing Cr, or on a Cr-containing layer coated on the Ni alloy substrate.”

For at least these reasons, claim 1, as amended, patentably distinguish over Rairden, III.

Amendment under 37 CFR §1.111
Application No. 10/506,537
Attorney Docket No. 042541


In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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Enclosures: Explanatory Figure

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